ARS Overseas Lab Sets the Stage for Reuniting a Weed and Its Enemies

The search is on for insects, mites, microbes, or nematodes that could nibble on, gnaw through, or sicken silverleaf nightshade in a biologically based approach to controlling this noxious weed, which hails from the Americas but has spread to southern Europe, Africa, India, Australia, and elsewhere.

Among other harm it causes, the purple-flowered perennial weed *Solanum elaeagnifolium* outcompetes native plants, reduces crop yields, and diminishes pasture productivity. Its toxin-containing orange berries can also poison livestock. Chemical and mechanical controls like mowing sometimes work against the weed. But severe infestations can render such controls too costly, impractical, or environmentally harmful to use repeatedly.

Biocontrol is considered sustainable because it involves releasing select natural enemies of the weed that will feed or develop on it exclusively and continue doing so until their host is reduced in numbers toward the natural balance that existed in its native range.

"Typically, these biological control agents are insects that severely damage or kill the weed, leave useful plants alone, and restore the ecological balance between the weed and its environment," explains Walker Jones, who, in April 2010, completed a 5-year assignment as director of the Agricultural Research Service's European Biological Control Laboratory (EBCL) near Montpellier, France.

Before returning stateside to lead ARS's National Biological Control Laboratory in Stoneville, Mississippi, Jones and ARS national program leader Daniel Strickman established a cooperative project with the Benaki Phytopathological Institute in Athens, Greece, to explore the feasibility of starting continental Europe's first-ever classical weed-biocontrol program.

Normally, EBCL serves as a sort of way station, where promising biocontrol agents collected from Europe, Asia, or Africa are screened for potential release into the United States to manage invasive species. But in this instance, the lab will switch gears—serving as a receiving point for candidate organisms from North America that could open the door to biologically controlling infestations of the weed in Greece and other countries in the Mediterranean basin, where effective native natural enemies have yet to be tested.

The first stages have already begun. At Montpellier, EBCL molecular biologist Marie-Claude Bon is using DNA-based methods to analyze the genetic diversity of silverleaf nightshade populations collected from sites in the southwestern United States, Argentina, Greece, France, and Australia. Her analysis will help to determine the weed's center of origin and trace the route of its world invasion.

"This, in turn, will pinpoint where to locate co-evolved natural enemies," says Jones. Once identified, they'll be sent to Montpellier and rigorously tested under quarantine to ensure their host specificity and safety as biocontrol agents intended for release.

First, however, a survey of Greece's weed populations must be completed. "After processing these data, we're hoping to use satellite photos to have a precise map of silverleaf nightshade populations and densities in various areas of Greece," says Javid Kashefi, an EBCL entomologist stationed at the American Farm School in Thessaloniki.

"This weed very likely came from the southwestern United States and northern Mexico," says Jones. "We wanted to use EBCL's unique experience, location, and facilities to establish a biocontrol project that would benefit Europe—sort of as thanks for the biocontrol agents we've acquired and sent to the United States for the past 90 years." There's also keen interest for similar projects in North African countries where silverleaf nightshade is the top weed pest, he adds.—By **Jan Suszkiw,** ARS.

This research is part of Crop Protection and Quarantine, an ARS national program (#304) described at www.nps.ars.usda.gov.

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Silverleaf nightshade *(Solanum elaeagnifolium).*